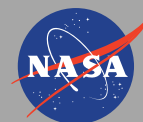


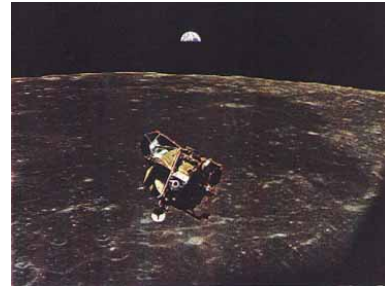
No Tow Trucks Beyond Mars

D. Rosing
S. Tucker
L. Kerber
K. Boykins



Jet Propulsion Laboratory
California Institute of Technology

Thank You



- Welcome to the 5th annual JPL panel at ComicCon
 - Special note: this is the 50th anniversary of Apollo 11 CSM/LM dock @ 21:35 UTC
- Everyone here on this panel has worked on amazing things that made amazing discoveries. This is our way of saying “thank you” to you, the taxpayers, for letting us be nerds and do things that no one else in the world has done. We could not have done it without your support (via congressional funding)
- We want to tell you stories of things or events that you just don’t hear about, even on Wiki. And we want to have fun sharing, so please don’t expect any finger pointing or dirty laundry.
- Rules
 - ITAR. We are bound by International Traffic in Arms Regulations. So if I interrupt Tracy or Shonte it’s not because there’s a conspiracy or anything, but we’re limited to what we can say in public on how we fix problems on the spacecraft.
 - Please let the speaker finish their story, we can answer a few questions, then go off to the next story. At the end we can answer more questions.
 - Have fun!

Who are these people?

- **David Rosing (41 years)**
 - BS Univ of Colorado, MS Stanford, Aerospace Engineering
 - Galileo (Jupiter), Magellan (Venus), IRAS (all-sky IR survey), Lambda-Point Experiment (Shuttle), VIMS instrument (Cassini-Saturn), Opto-Mechanical engineering group supervisor, Mars aircraft & instruments, Mars Sample Return future mission concepts
- **Shonte Tucker (27 years)**
 - BS UC San Diego, MS North Carolina A&T, Mechanical Engineering and Heat transfer
 - Systems Engineer working at NASA's Jet Propulsion Laboratory; worked numerous orbiter and landed missions in phases ranging from conceptual studies to flight operations. Currently the Payload Verification and Validation Lead for the Mars 2020 rover mission.
- **Laura Kerber**
 - Planetary geologist specializing in alien deserts and extraterrestrial volcanoes. Currently Deputy Project Scientist of the Mars Odyssey mission.
- **Kobie Boykins (23 years)**
 - BS Mechanical Engineering, Rensselaer Polytechnic Institute
 - MARS Pathfinder, Mars Exploration Rovers, Mars Science Lab, Mars 2020 ECOSTRESS, OCO-3, Jason-2, Jason-3, SWOT, NISAR, Grace-FO, Potential Europa Clipper and Lander
 - Member of Division Staff, Mechanical Engineering, Section Manager, Group Supervisor

To Boldly Go Where There Are No Gas Stations

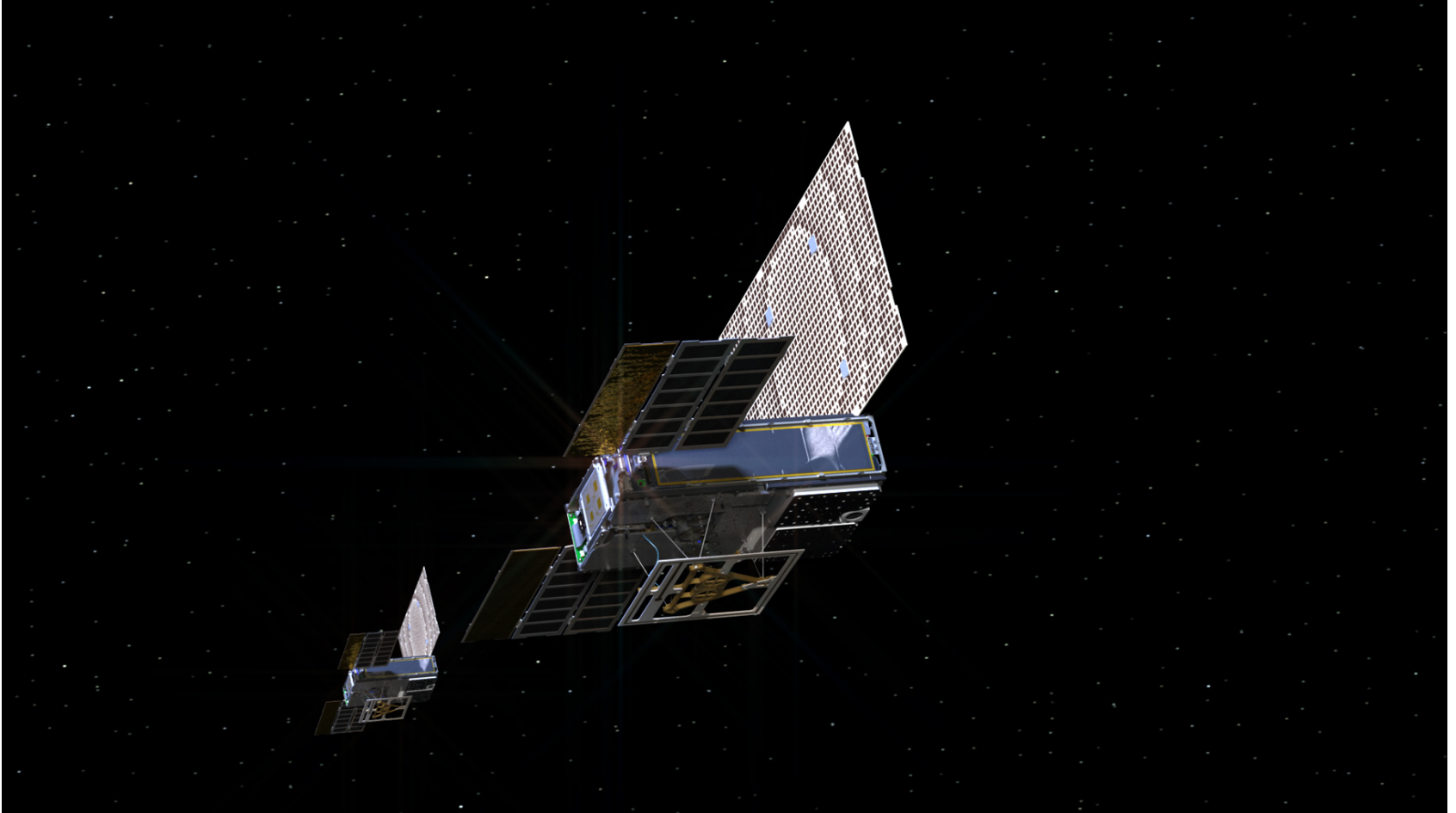
- There is no auto club at Mars, Jupiter, Saturn
- One way light time can be 30 minutes to a few hours
- The slightest mistake or miscalculation can ruin your day and the mission

Questions to the crew:

- 1) The most fun project you had at JPL
- 2) The worst moment you had
- 3) The best moment you had
- 4) Most challenging problem you overcame (in a way that is ITAR correct)
- 5) Inspiration: Your own and how you inspire others
- 6) Did you ever have “Captain Kirk” moment?

” I’ve cheated death. I tricked my way out of death ...and patted myself on the back for my ingenuity. . . .” (TWOK, 1982)

MARCO

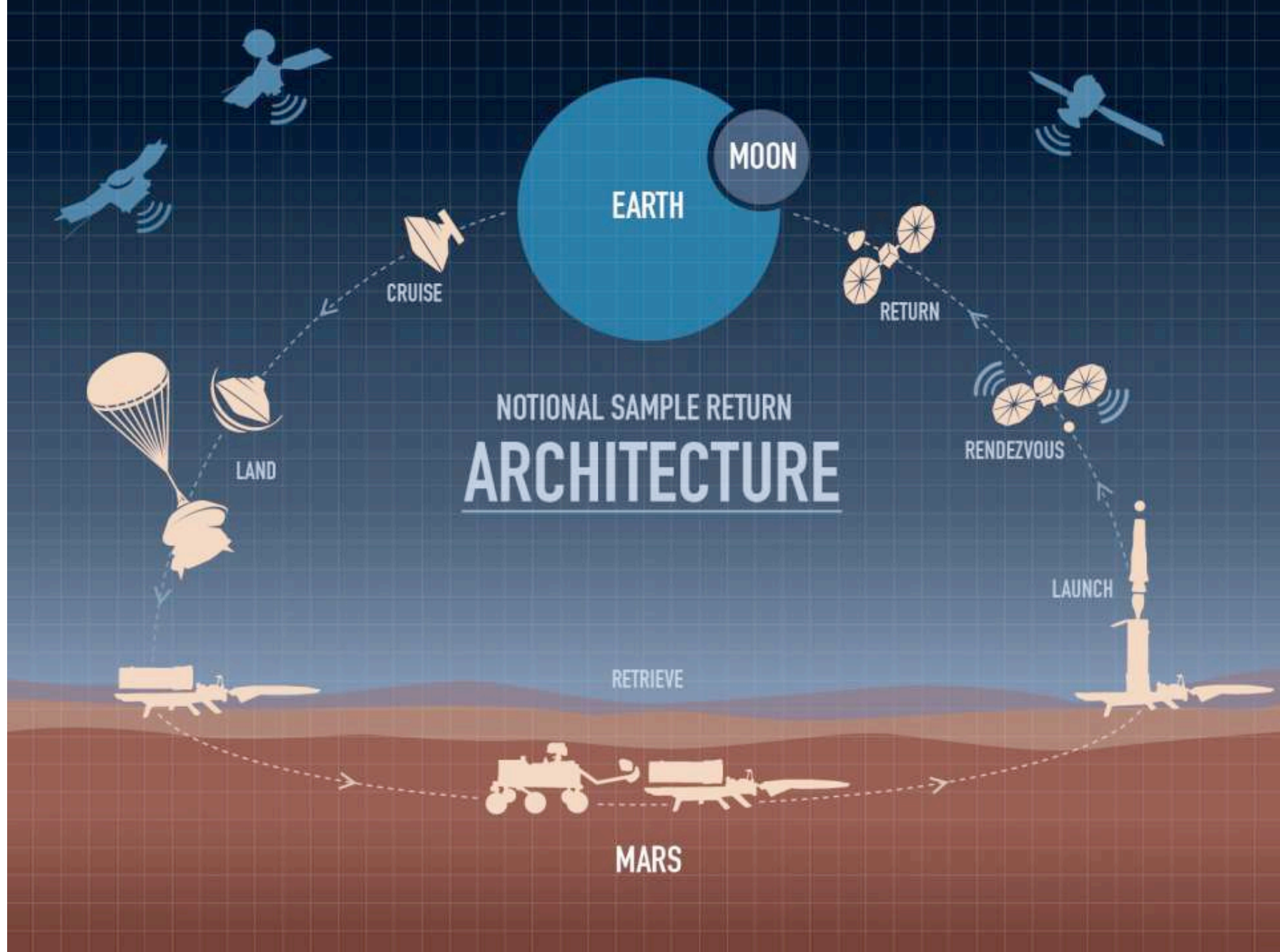


M2020 Mobility Assembly



Inspiration, Circa 1968





DECADAL SURVEY MSR CONCEPTS

Sample Caching Rover

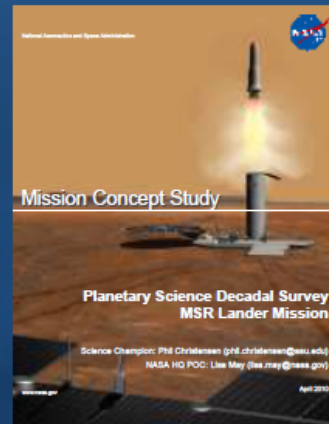


- MSL-heritage Skycrane EDL
- MAX-C Rover (solar powered)
 - Sample Caching System
 - Instrument suite for sample selection/context
 - 2 integrated caches, each w/ 19 sample tubes

Key Technologies

- Sample Caching System
- Terrain Relative Navigation

Sample Return Lander



- MSL-heritage Skycrane EDL
- Pallet Lander
 - Fetch Rover (157 kg)
 - Mars Ascent Vehicle (2-stage Solid-Solid)
 - 17-cm OS

Key Technologies

- Mars Ascent Vehicle
- Fast Fetch Rover

Sample Return Orbiter



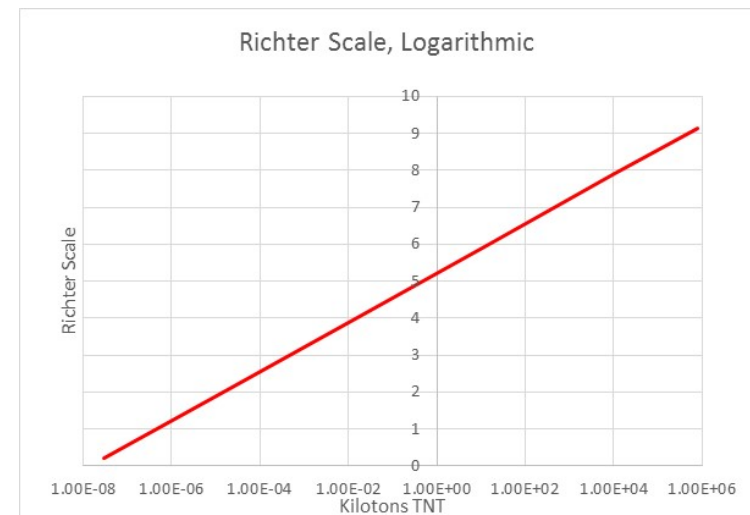
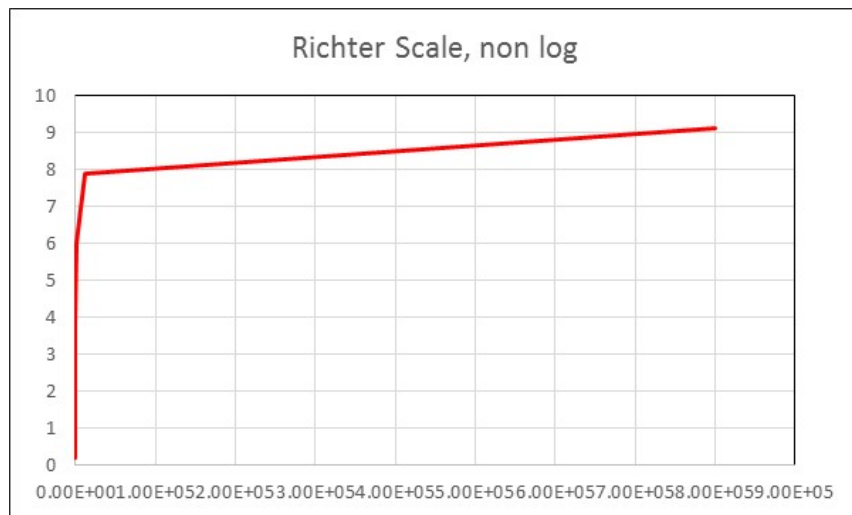
- Round-trip Orbiter (Chemical Propulsion)
 - MOI, Aerobrake
 - OS Rendezvous & Capture
 - Earth Return
 - Earth Entry Vehicle
- Mars Returned Sample Handling

Key Technologies

- OS Rendezvous and Capture
- Back Planetary Protection

Movies: “Real” vs. “Reel”

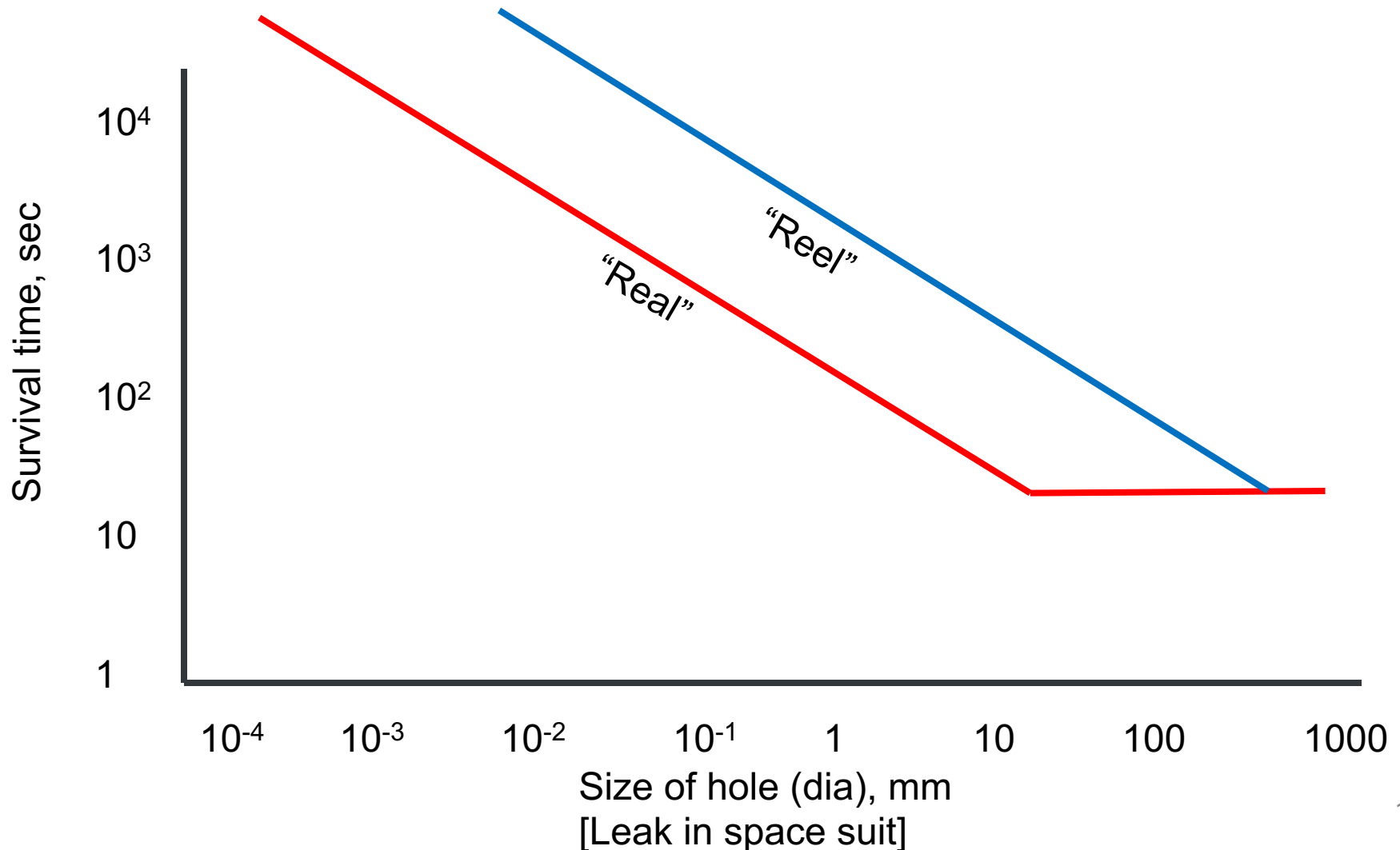
- Logarithmic plot: Example Richter scale



kTon TNT	Richter Scale
3.00E-08	0.2
2.10E-05	2.1
0.011	3.91
15	6
10700	7.9
800000	9.15

Movies: “Real” vs. “Reel”

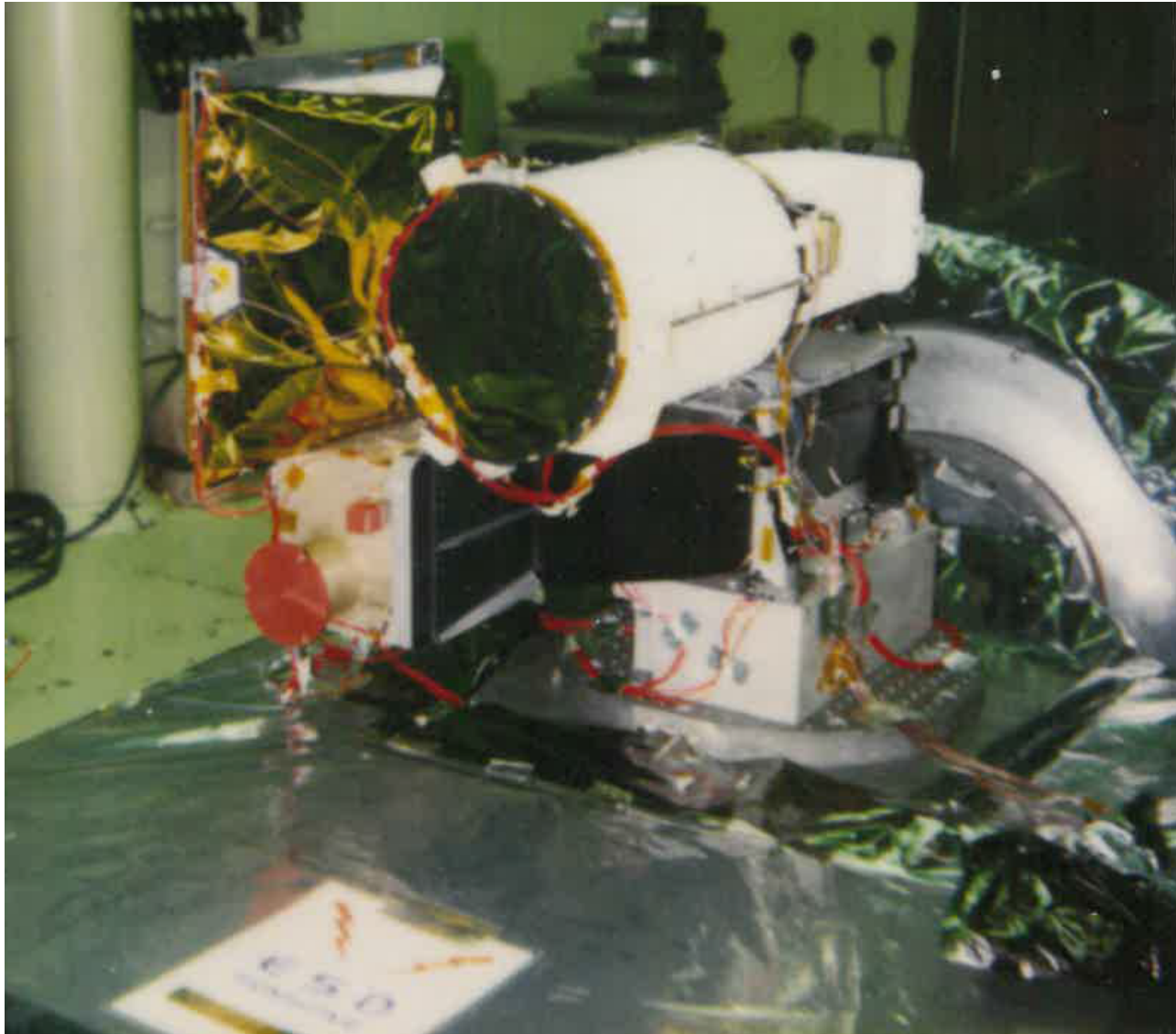
- Log-log chart, “Survival time” vs. “Severity of failure”



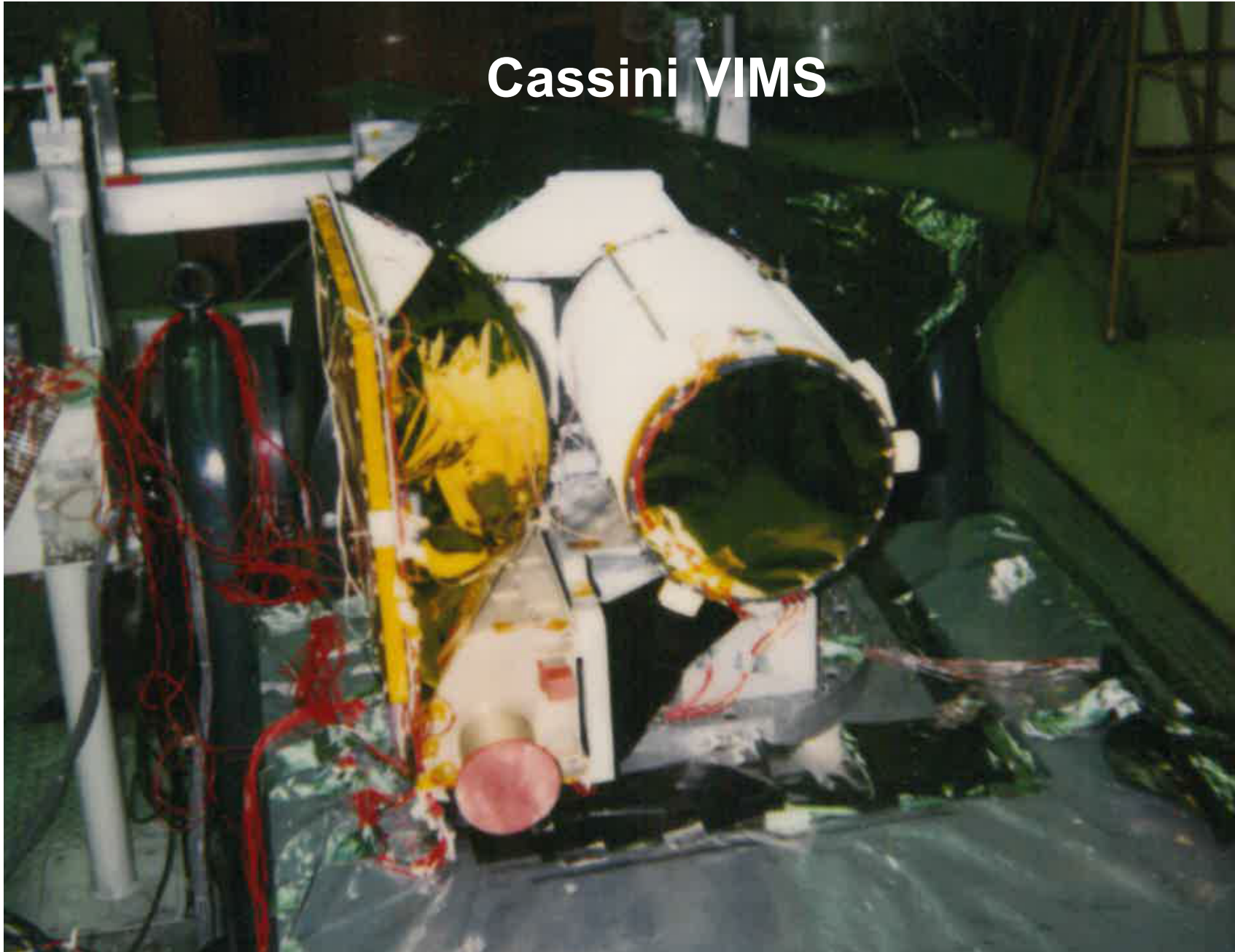
More questions?

- For the remainder of ComicCon I'll be at Small Press booth L-03
 - Come on by to chat Space or Kickstarters

Cassini VIMS



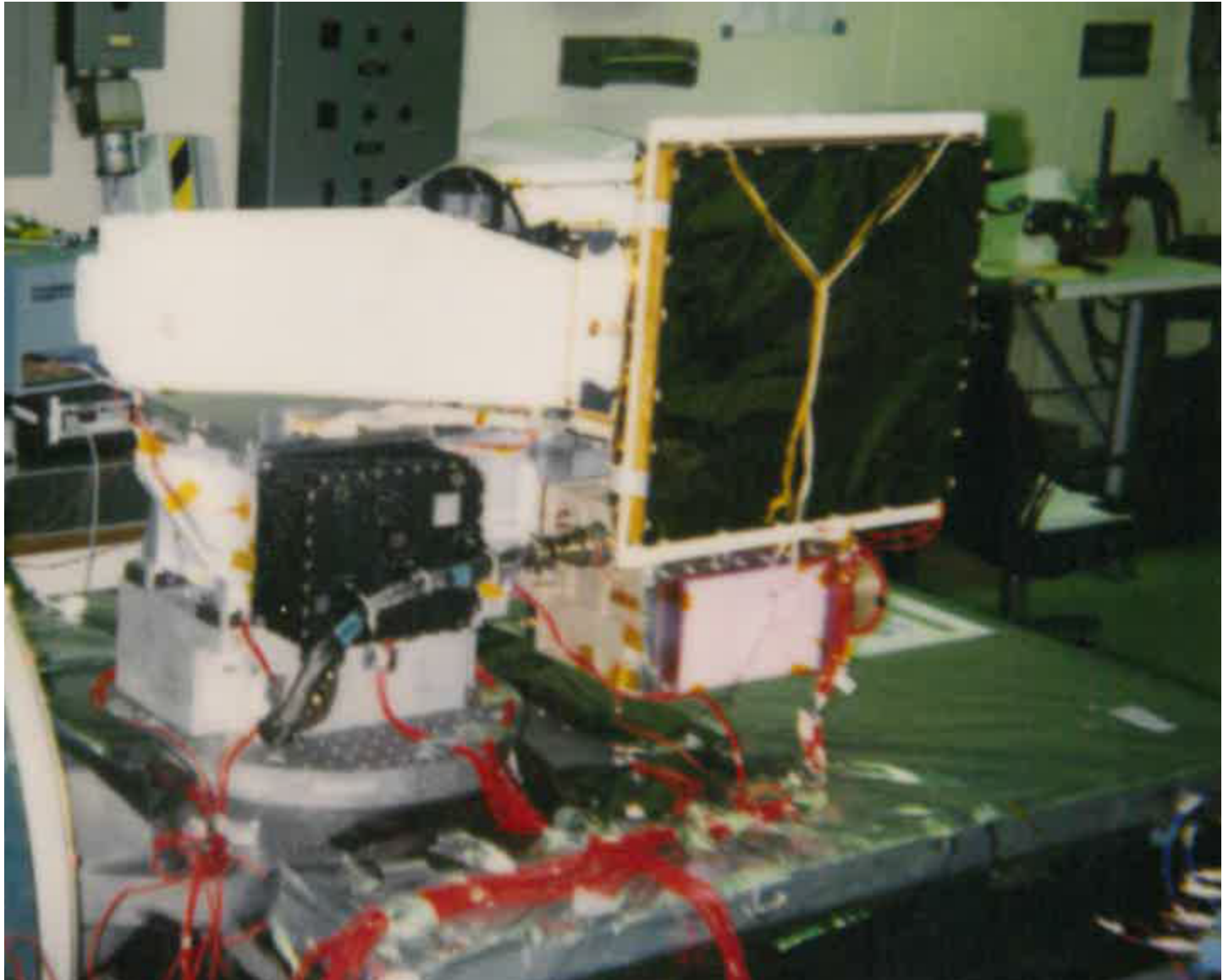
Cassini VIMS



Cassini VIMS



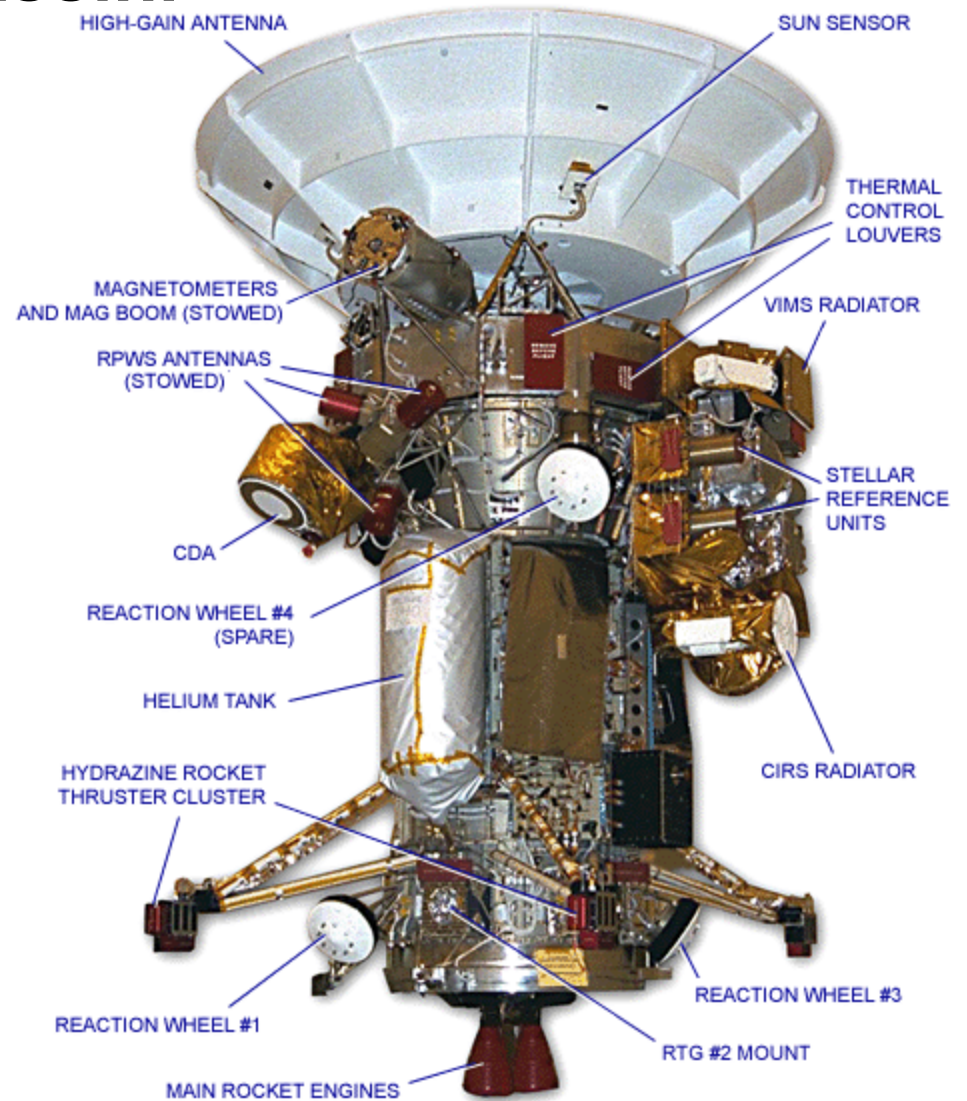
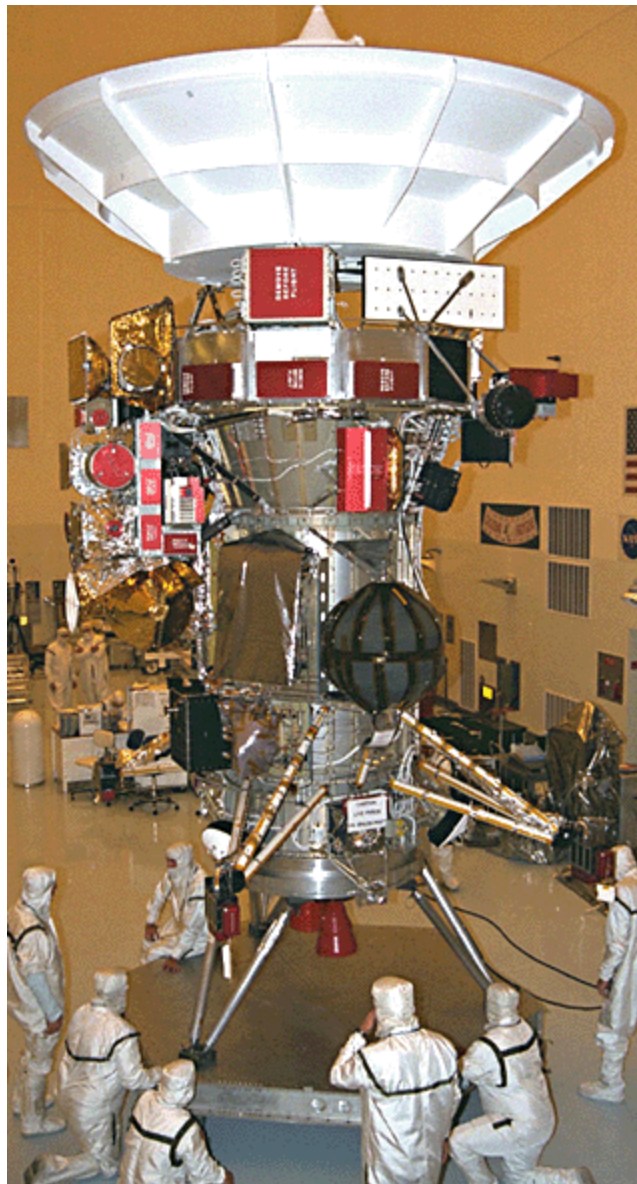
Cassini VIMS



Cassini



Cassini



Cassini



Shonte Tucker

Senior Thermal Engineer
Jet Propulsion Laboratory
July 21, 2019



The opinions expressed herein are my own opinions and do not necessarily reflect the opinions of the California Institute of Technology or the Jet Propulsion Laboratory

Shonte Tucker *Alias* Kapton Girl



What is Kapton?

Kapton is a polyimide film developed by DuPont™ in the late 1960s that remains stable across a wide range of temperatures, from -452°F to 752°F (-269°C to $+400^{\circ}\text{C}$ / 4K to 673K).

Kapton in tape form is generally referred to as

Duct Tape for Space

Kapton Tape



Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government or the Jet Propulsion Laboratory, California Institute of Technology.

Some Tools of the Trade

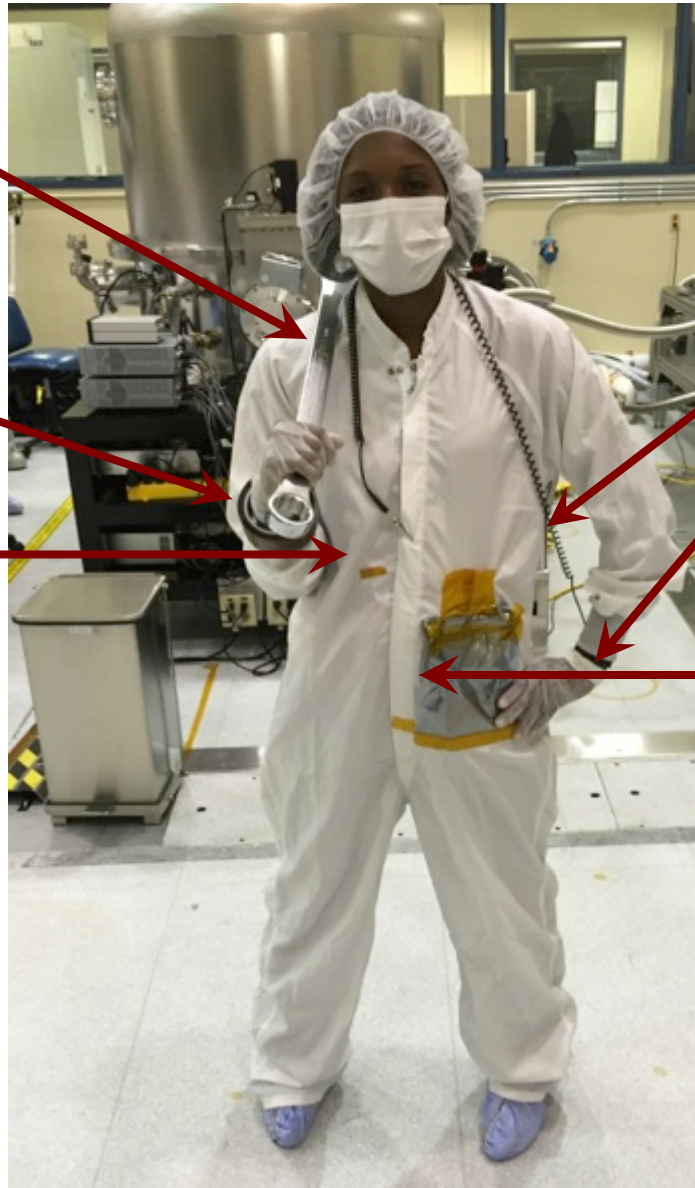
1 5/8" Wrench
for large nuts/bolts

Kapton Tape
(2" Roll)

Kapton Tape
*randomly attached to
cleanroom (bunny)
suit*

**Anti Static Wrist
Strap and Cord**

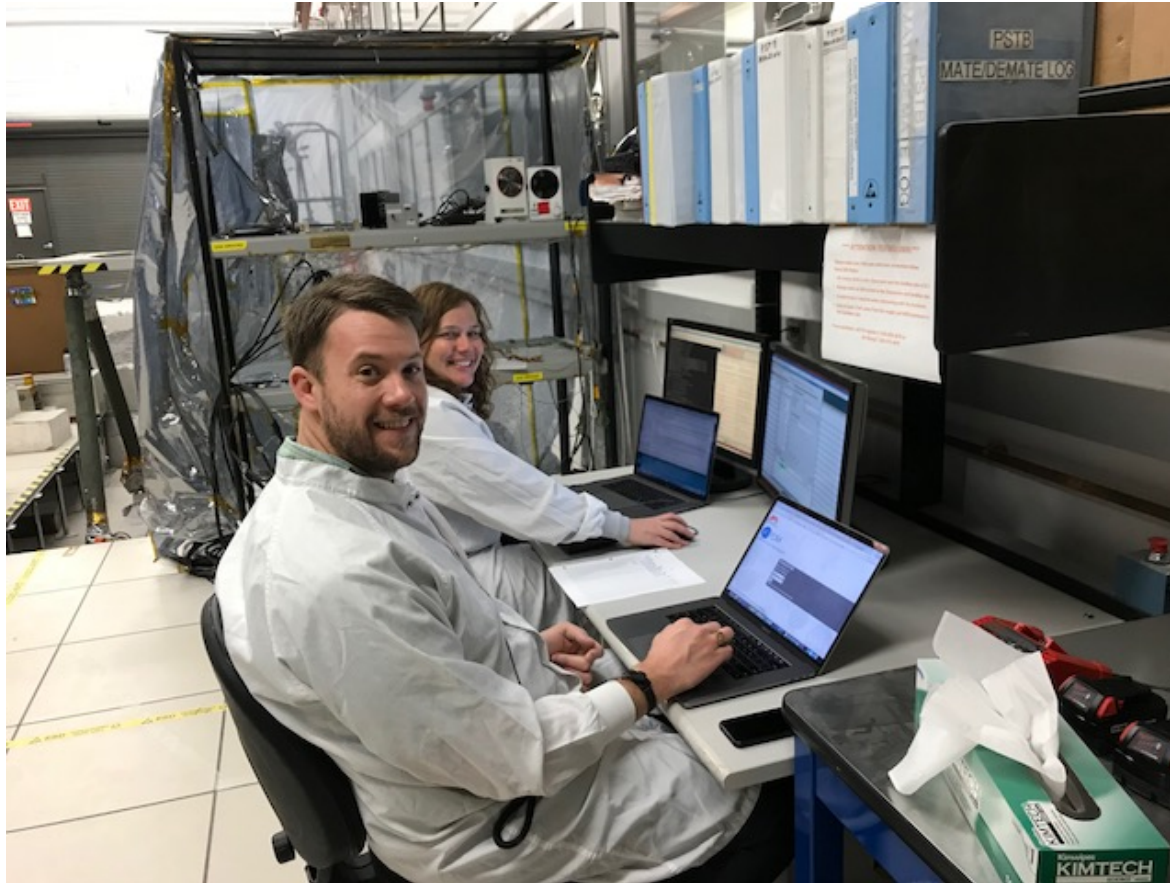
Anti Static Bag



Testbeds

- Flight Software Testbeds
- Vehicle System Testbeds

Mars 2020 Flight System Testbed



Zach Bailey (*Mastcam-Z Instrument Engineer*)
and Jennifer Rodriguez (*Testbed Engineer*)

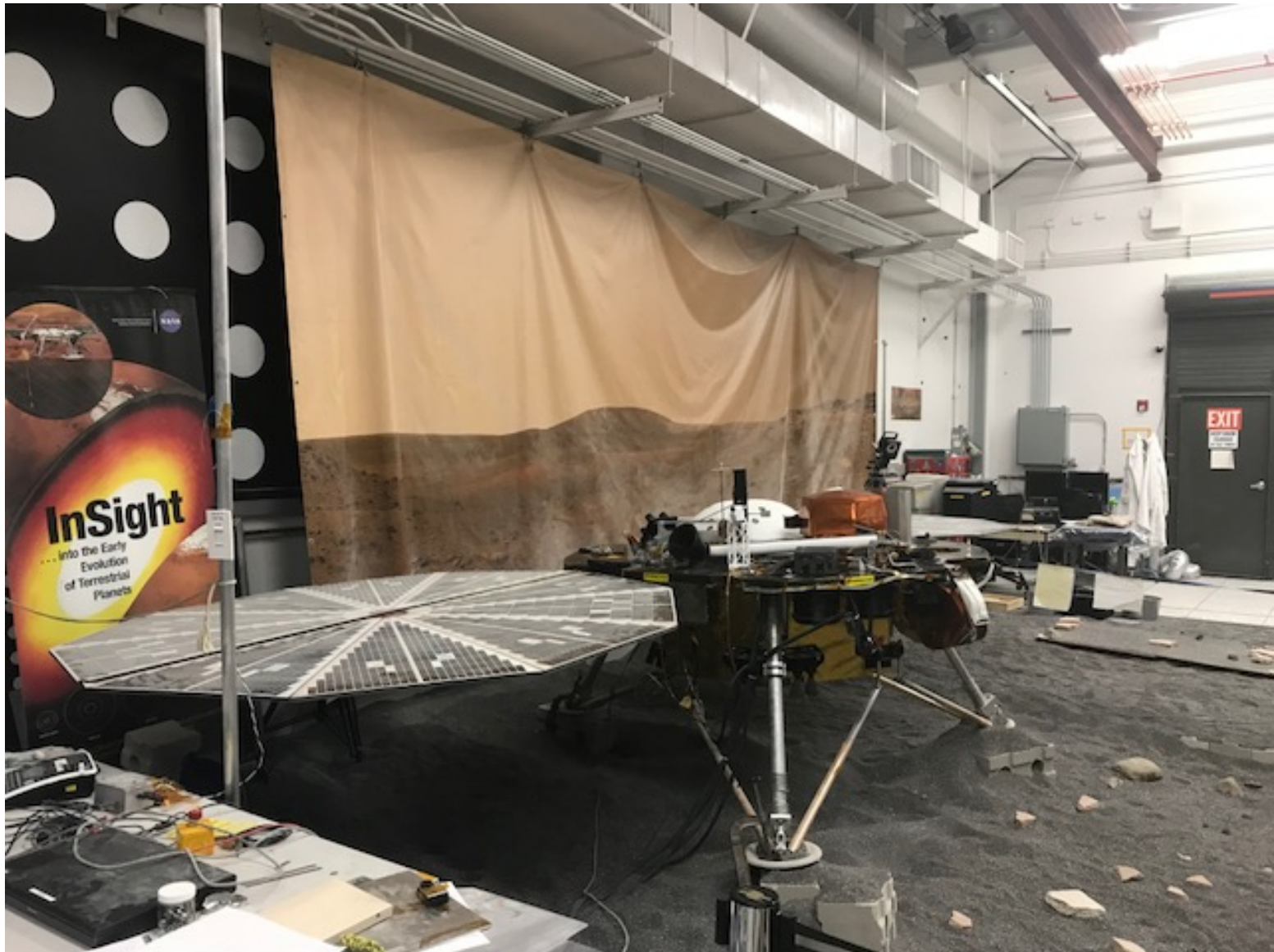
Mars Science Laboratory (MSL) Curiosity Rover Vehicle System Testbed



MSL Curiosity Rover Vehicle System Testbed



InSight System Testbed



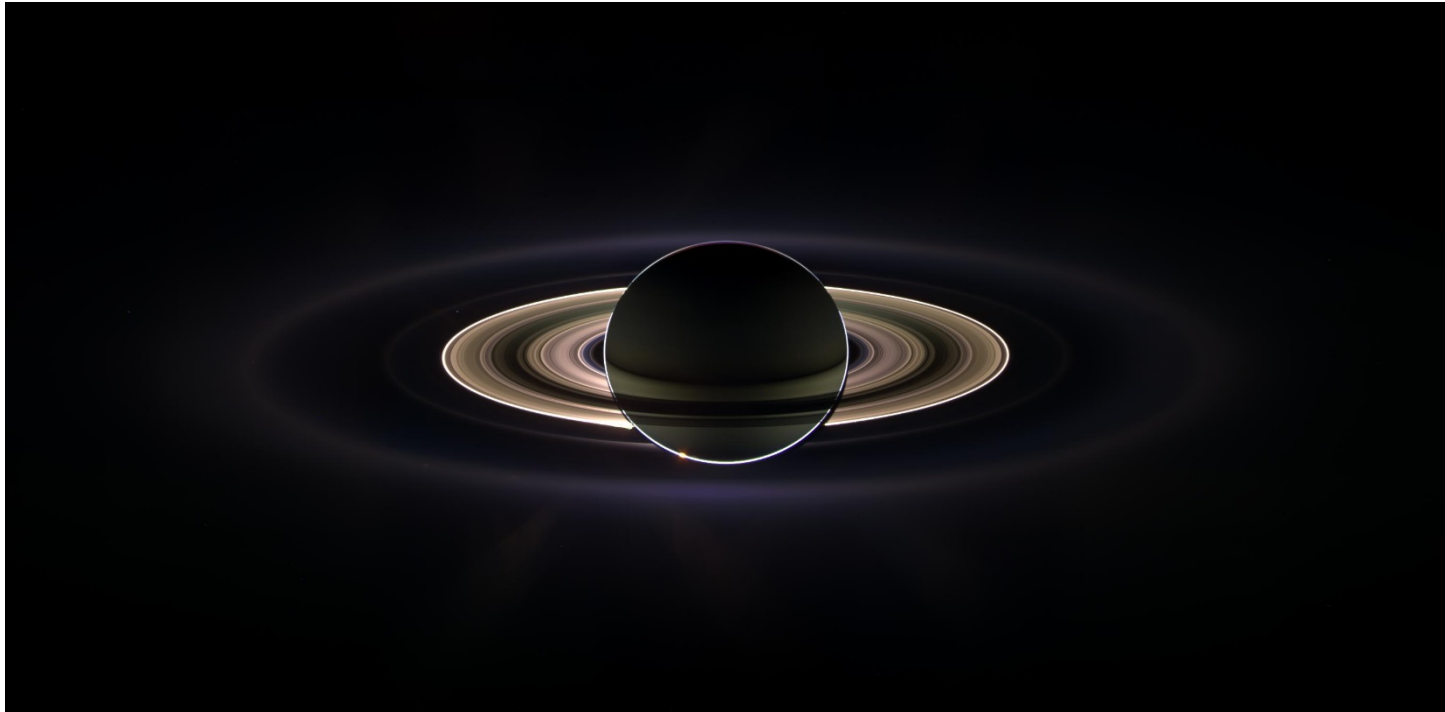
Mars Rover Family

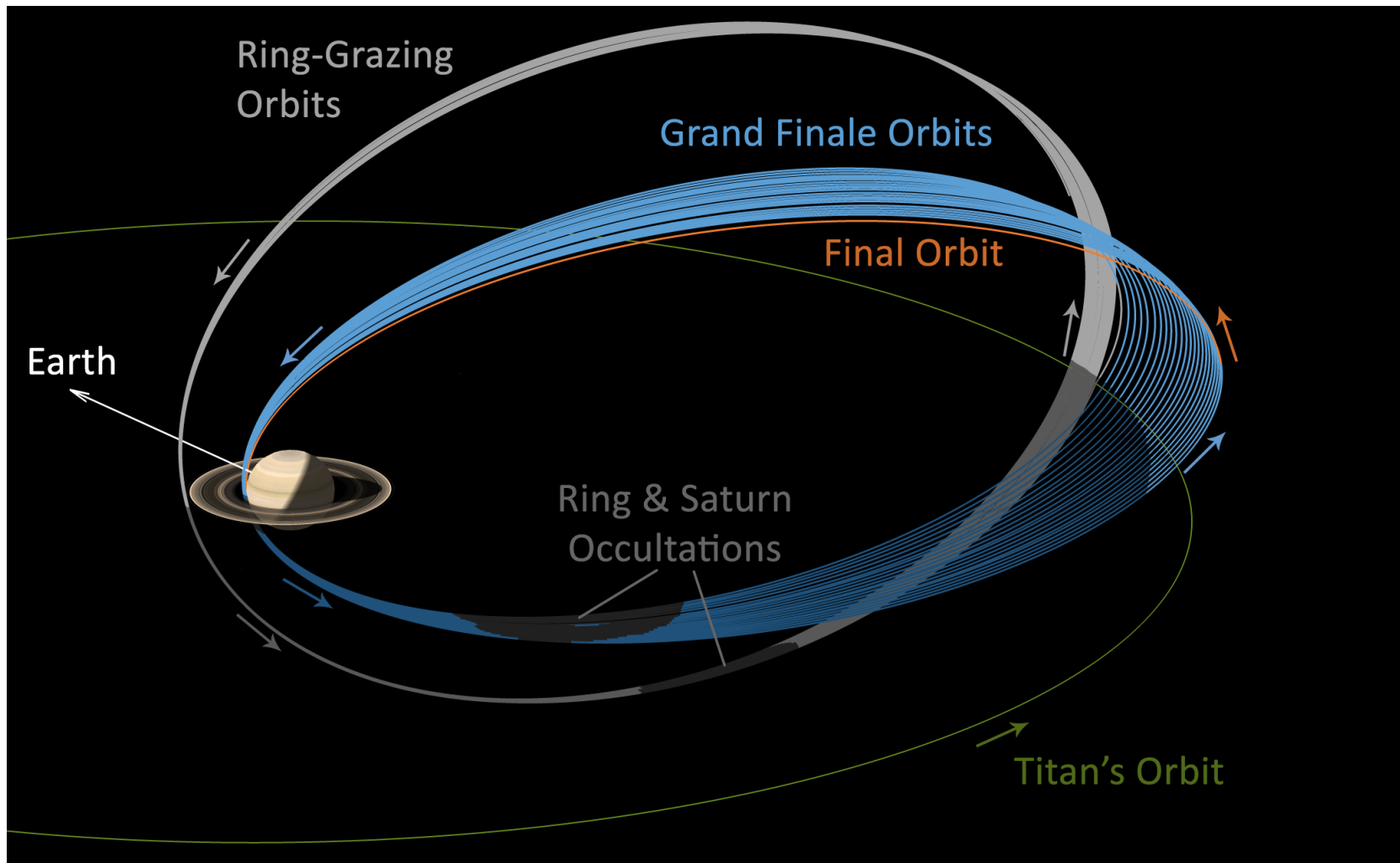




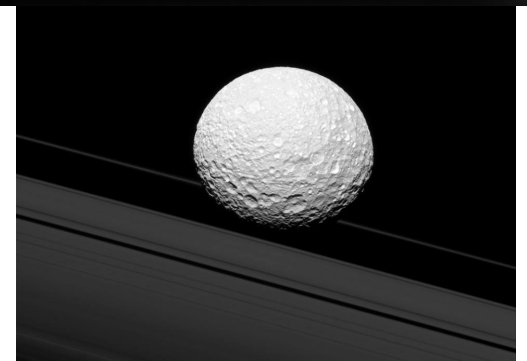
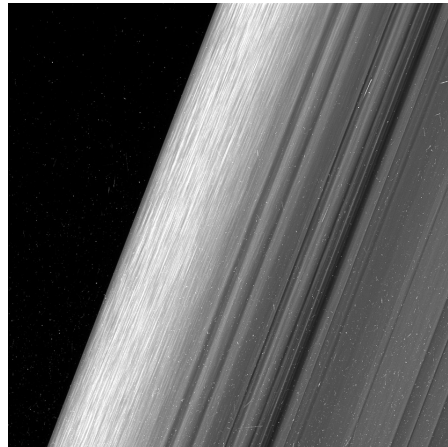
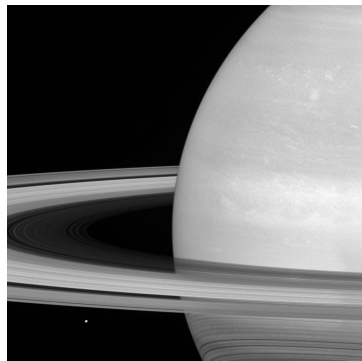
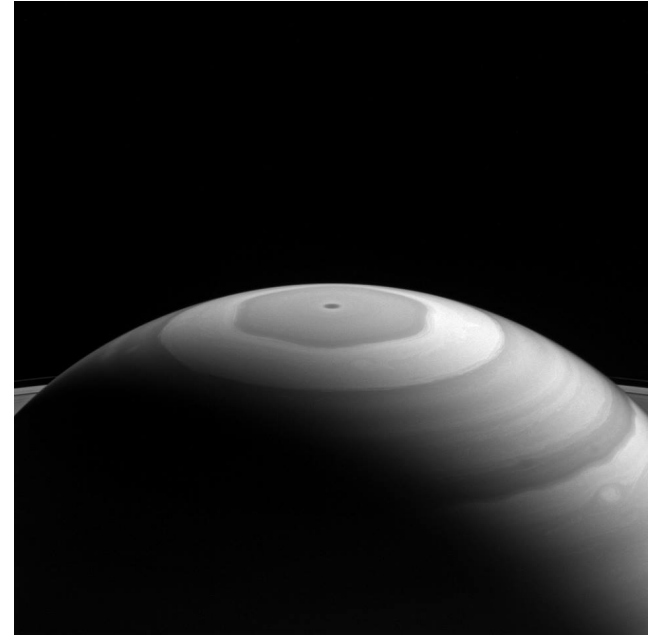
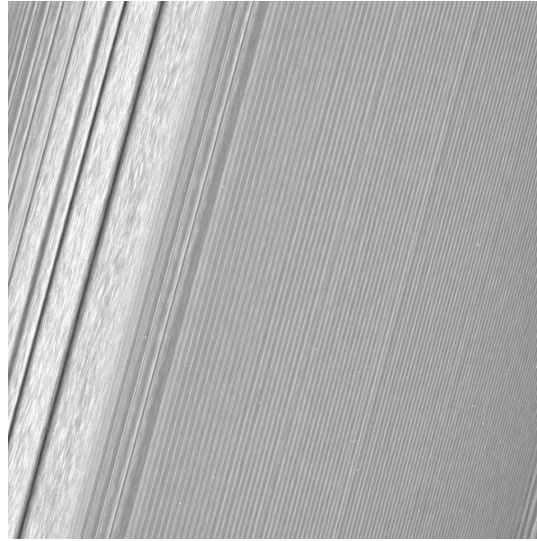
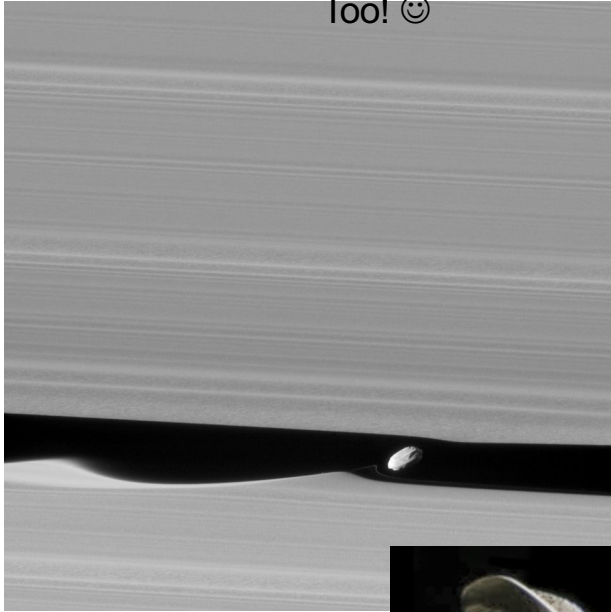
Voyager Interstellar

National Geographic Cover 12/2006





The Pics from F-Ring Orbits—and Stay Tuned for Proximal Orbit Images,
Too! 😊

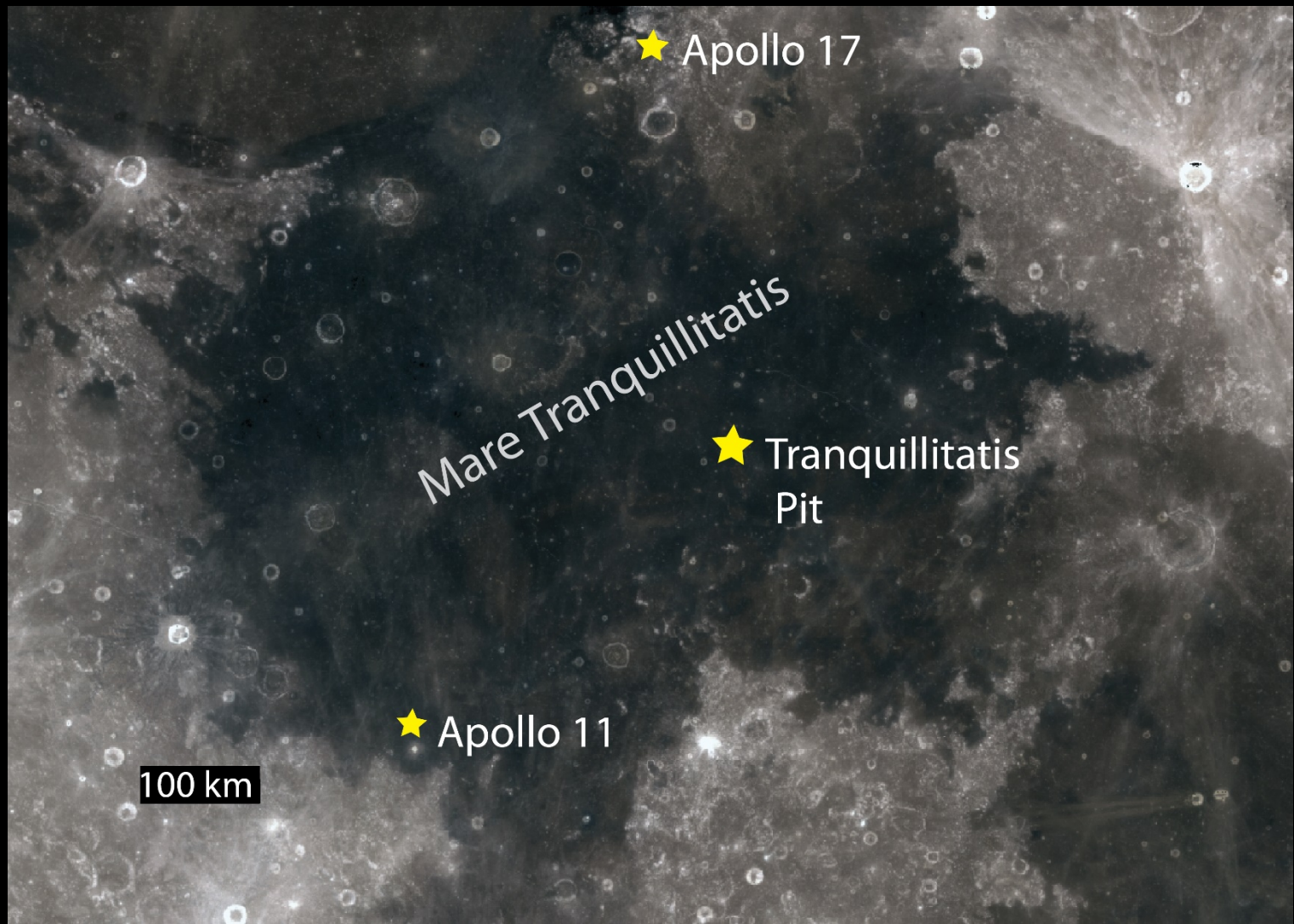


Dr. Laura Kerber



moon diver

A mission that does not, and may never, exist...

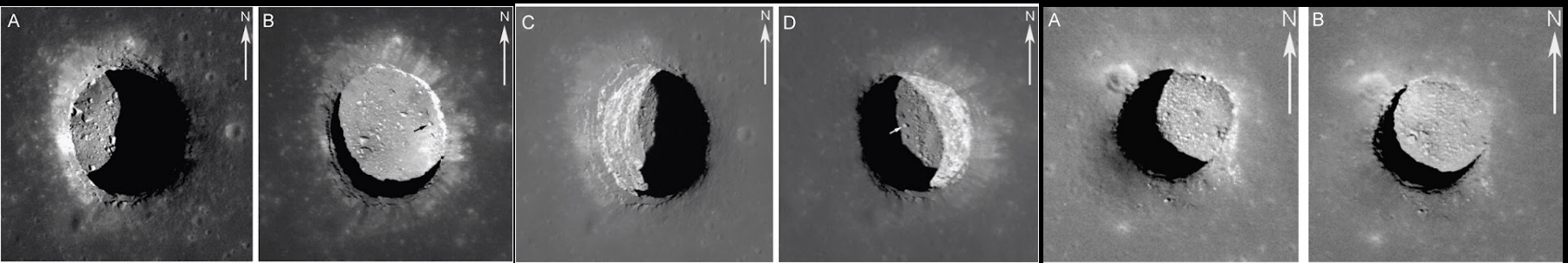


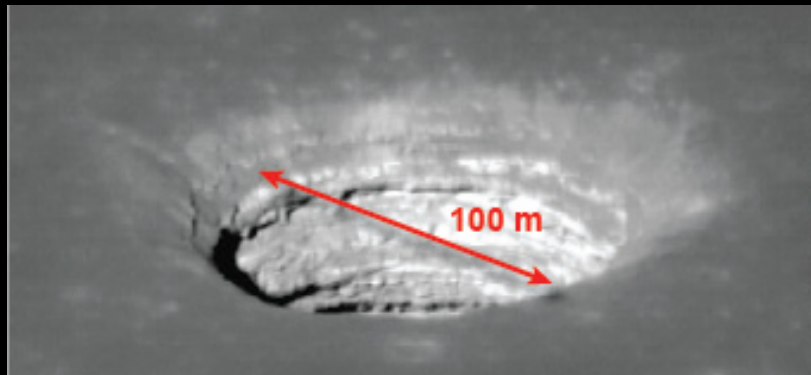
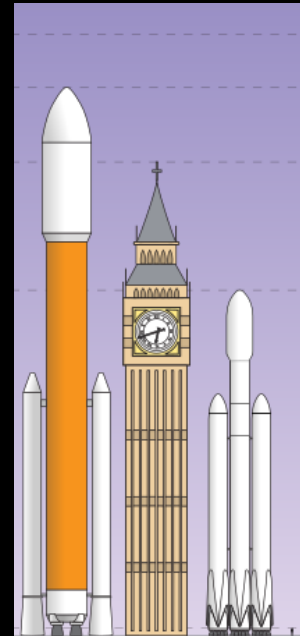


Video by John Moore

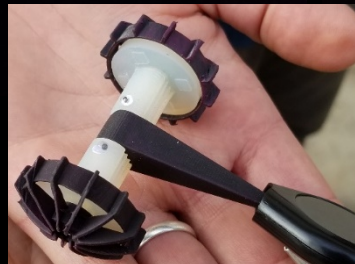
Tranquillitatis

~ 50 m









The Future of Moon Diver

1. More hard work
2. Peril
3. Additional hard work
4. Luck
5. Additional peril



MOON DIVER MISSION ACE

To commemorate not just Apollo 17's visit to the valley of Taurus Littrow, but as an everlasting commemoration of what the real meaning of Apollo is to the world, we'd like to uncover a plaque... so that when this plaque is seen again by others who come, they will know where it all started. This is our commemoration that will be here until someone like us, until some of you who are out there who are the promise of the future, come back to read it again, and to further the exploration and the meaning of Apollo.

Probably the most significant thing that we can think about when we think about Apollo is that it has opened for us, for us meaning the world, a challenge of the future. The door is now cracked, but the promise of that future resides in the young people not just in America, but the young people all over the world, learning to live and learning to work together.